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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/796,978	03/11/2004	Takaaki Kawahara	403001	4044

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EXAMINER	
LEE, CHEUNG	

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 03/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/796,978	KAWAHARA ET AL.
	Examiner	Art Unit
	Cheung Lee	2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Notice to Applicant

1. Applicants' Amendments and Response to the Office Action mailed on October 18, 2005 have been entered and made of record.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahn et al. (US Pub 2004/0175882; hereinafter "Ahn") in view of Chang et al. (US Pat 6884719; hereinafter "Chang").

With respect to claims 1, 5 and 9, referring to figures 4-5, Ahn discloses a method for manufacturing a semiconductor device comprising: forming a second insulating film (step 430) in a plurality of repeated and continuous cycles (step 450; page 7, paragraph 74), each cycle comprising: supplying film-forming materials and adsorbing the film-forming materials (page 3, paragraphs 37-38); purging the film-forming materials that have not been adsorbed (step 435); supplying oxidants to oxidize the adsorbed film-forming materials (step 440); and purging the oxidants that have not contributed to oxidization (step 445); and forming a gate electrode (552) on the second insulating film. Ahn also discloses a predetermined number of cycles to form the

second insulating film (page 7, paragraph 74), the predetermined number of cycles comprises an initial number of cycles, but Ahn does not disclose expressly wherein forming a first insulating film on a substrate; purging in the initial number of cycles, the oxidant purging time is longer than that of cycles after the initial number of cycles; and the film-forming materials purging time in the initial number of cycles is longer than that of the cycles after the initial number of cycles. However, the purpose of purging is to remove all the excess reactants or oxidants, and Ahn discloses purging process to remove excess precursor gas and reaction by-products (page 7, paragraph 70). Therefore, any variation in purging times in the present claim is obvious in light of the cited art, because the changes in purging times produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

Chang discloses a barrier layer, such as a silicon nitride layer, which is formed on a wafer before formation of a dielectric coating (col. 7, lines 29-40). Also, Chang discloses high oxidizing flow rate for longer period of time for first reaction cycles, but it is decreased for later reaction cycles for a shorter period of time (col. 10, lines 45-53). So, if these oxidation cycles are used in Ahn's oxidation cycles, it would have been obvious that the purging process time will be higher in first reaction cycle than in later cycles to remove grater excess oxidants in first reaction cycle.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to form a barrier layer on the substrate, and use an elevated oxygen concentration, as taught by Chang.

The motivation for doing so would have been to obtain a smooth channel region top surface to increase electron mobility, and to reduce unwanted dangling bonds.

3. With respect to claims 2, 6 and 10, Ahn in view of Chang does not disclose expressly wherein the first purging times for purging the oxidants in the initial number of cycles is 5 to 15 times longer than the purging times of the oxidants in the cycles after the initial number of cycles; and the first purging times for purging the film-forming materials in the initial number of cycles is 5 to 10 times longer than the second purging times of the film-forming materials in the cycles after the initial number of cycles. However, any variation in purging times of the oxidants and the film-forming materials in the present claim is obvious in light of the cited art, because the changes in purging times of the oxidants and the film-forming materials produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

4. With respect to claim 13, Ahn in view of Chang discloses supplying a larger quantity of the oxidants in the initial number of the plurality of cycles than in the cycles after the initial number of cycles (Chang, col. 10, lines 45-53).

5. With respect to claim 14, Ahn in view of Chang does not disclose expressly wherein the quantity of the oxidants supplied in the initial number of cycles is 2 to 3 times larger than the quantity of the oxidants supplied in the cycles after the initial number of cycles. However, any variation in quantity of the oxidants in the present claim is obvious in light of the cited art, because the changes in quantity of the oxidants produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

6. With respect to claim 17, Ahn in view of Chang discloses wherein supplying the oxidants in a plurality of separate cycles (Ahn, page 7, paragraph 74), but Ahn in view of Chang does not disclose expressly that in an initial number of the plurality of cycles larger in number than the number of cycles following the initial number of cycles. However, Chang discloses supplying a larger quantity of the oxidants in an initial number of cycles than in the cycles after the initial number of cycles (col. 10, lines 45-53), so it is obvious that the number of supplying the oxidants in the initial number of cycles is larger than that of cycles after the initial number of cycles.

7. With respect to claim 18, Ahn in view of Chang does not disclose expressly wherein the number of the separate cycles of supplying the oxidants in the initial number of cycles is 2 to 3 times larger than the number of the cycles of supplying the oxidants in the cycles following the initial number of cycles. However, any variation in

number of separate cycles in the present claim is obvious in light of the cited art, because the changes in number of separate cycles produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

8. With respect to claims 3, 7, 11, 15 and 19, Ahn in view of Chang discloses the second insulating film is selected from the group consisting of HfO_2, $HfAlO_x$, $HfSiO_x$, and nitrides thereof (Ahn, page 6, paragraphs 61 and 74; Chang, col. 10, lines 53-64).

9. With respect to claims 4, 8, 12, 16 and 20, Ahn in view of Chang does not disclose expressly wherein the initial number of cycles is 10 to 20 cycles (5 to 20 cycles in claims 16 and 20). Ahn discloses a predetermined number of cycles to form the second insulating film (page 7, paragraph 74), the predetermined number of cycles comprises an initial number of cycles. Any variation in initial number of cycles in the present claim is obvious in light of the cited art, because the changes in initial number of cycles produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406.

Response to Amendments

10. In view of Applicants' amendment to the specification, the objection to the specification has been withdrawn.

11. In view of Applicants' amendment to the claims, the objection to claims 9-12 has been withdrawn.

12. In view of Applicants' amendment to the claims, the rejection of claims 17-20 under 35 U.S.C. 112, second paragraph, has been withdrawn.

13. Applicants' arguments with regard to the rejection under 35 U.S.C. 103(a) have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

14. Applicants argue that Ahn does not disclose a first insulating film, but Chang discloses a barrier layer, such as a silicon nitride layer, which is formed on a wafer before formation of a dielectric coating (col. 7, lines 29-40). See arguments and motivation stated in claims 1, 5 and 9 above.

15. Applicants also argue that Ahn in view of Chang does not disclose wherein varying any purging times in different cycles, with longer purging times being employed in initial cycles than in later cycles. However, the purpose of purging is to remove all the excess reactants or oxidants, and Ahn discloses purging process to remove excess precursor gas and reaction by-products (page 7, paragraph 70). Therefore, any variation in purging times in the present claim is obvious in light of the cited art, because the changes in purging times produce no unexpected function. The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the part. Patentability over the prior art will only occur if the parameter variation

produces an unexpected result. *In re Aller, Lacey and Hall*, 105 USPQ 233, 235. *In re Reese* 129 USPQ 402, 406. Besides, if different flow rates are used in different cycles as stated in Chang, obviously the purging time will be different. See arguments stated in claims 1, 5 and 9 above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Cheung Lee

March 17, 2006

HA NGUYEN
PRIMARY EXAMINER